

NON-PUBLIC?: N
ACCESSION #: 8905150112
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Station, Unit 2 PAGE: 1 OF 7

DOCKET NUMBER: 05000270

TITLE: Unit Trip Due to Management Deficiency for Poor Housekeeping
EVENT DATE: 04/03/89 LER #: 89-004-00 REPORT DATE: 05/03/89

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: H. R. Lowery, Oconee Safety Review Group TELEPHONE: (803) 885-3034

COMPONENT FAILURE DESCRIPTION:
CAUSE: E SYSTEM: SD COMPONENT: XIS MANUFACTURER: M225
REPORTABLE TO NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO EXPECTED SUBMISSION DATE:

ABSTRACT:

On April 3, 1989, at 1007 hours, Oconee Unit 2 tripped from 100% Full Power. Plant response to the trip was normal, with no radiological releases or Engineered Safeguards actuations. The trip resulted from a falling object striking the Condensate Booster Pump (CBP) Emergency Low Suction Pressure pressure switch. The impact shifted the instrument setpoint resulting in a trip of CBPs followed by Main Feedwater Pump trip and anticipatory Reactor trip. Emergency Feedwater actuated and maintained decay heat removal. The root cause is MANAGEMENT DEFICIENCY, poor housekeeping.

END OF ABSTRACT

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BACKGROUND

The secondary systems at Oconee include the Condenser Hotwell EIIS:SD!, three Hotwell Pumps EIIS:P!, Condensate Purification Demineralizers EIIS:DM!, three Condensate Booster Pumps (CBPs), two Main Feedwater Pumps and

miscellaneous other components such as heaters EIIS:HX!. Since pressure drops across the demineralizers vary over time due to operating conditions, the danger exists that the CBPs might be damaged if available suction pressure falls below minimum net positive suction head. There are two pressure switches EIIS:XT! which monitor CBP suction pressure. PS-227 will start an additional Hotwell pump (if available) when CBP suction pressure is low. PS-228 will actuate a time delay relay if pressure falls to 19.3 psig. If the relay remains energized for 5 seconds, a CBP Emergency Low Pressure Trip is generated which will trip all operating CBPs. Trip of the CBPs will then cause trips of the Main Feedwater Pumps, the Turbine/Generator EIIS:TRB/GEN!, and the Reactor.

The two pressure switches PS-227 and PS-228 are mounted on an instrument panel attached at eye level to a column in the Turbine Building basement. There are two 2-112 inch pipe sleeves imbedded in the floor above, approximately 3 inches from the column. These sleeves were spares intended to pass control or instrument cables through the floor. Prior to the incident, these particular sleeves were not used or plugged with pipe plugs. The area on the Turbine Building mezzanine floor near the column is frequently used during unit outages as a working area for fabrication of piping sections and hangers.

When an Oconee unit trips, the first source of backup power is the Switchyard via a Start-up Transformer EIIS:XFMR! and Start-up Feeder Breakers EIIS:BRK!. The transfer from Normal power to Start-up power has two modes. A rapid transfer occurs if the Main Generator Power Circuit Breakers (PCBs) are still closed, because that condition indicates that the Main Feeder Bus EIIS:EA! is still connected to the Switchyard and is still synchronized. If the PCBs are open, then synchronization can not be assumed, and a one second time delay is imposed to allow Main Feeder Buss voltage to decay. After one second, the voltages are low enough that lack of synchronization is not a concern, and transfer is completed. The actual mode used is determined by the cause of the trip and the relative speed of relay logic paths and breaker response times.

Many controls on individual components are powered via transformers connected to the component motor power supply EIIS:EC!. Typically a 600 volt motor circuit will power a 125 volt control circuit. When control logic is satisfied, a control relay EIIS:RLY! is energized, which completes the connections in the 600 volt circuit.

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EVENT DESCRIPTION

At 1006:54 hours on April 3, 1989, the Oconee Unit 2 Condensate Booster Pump (CBP) Emergency Low Suction Pressure Switch PS-228 went into alarm. Following

a five second time delay, the CBP's tripped, followed rapidly by trips of the Main Feedwater Pumps (MFWP), the Reactor, and the Turbine/Generator.

All Control Rod Drive Breakers EIIS:AA! opened and all Control Rods dropped to shutdown the unit. The Reactor Coolant System (RCS) EIIS:AB! responded as expected. The average RCS temperature stabilized six minutes into the transient at 554 degrees Fahrenheit. Pressurizer EIIS:VSL! level decreased from 220 inches to a minimum of 80 inches then was maintained at 155 inches by manually starting the 2B High Pressure Injection Pump EIIS:BQ!. The RCS maximum pressure was 2200 psig.

The two Motor Driven and one Turbine Driven Emergency Feedwater Pumps EIIS:BA! started due to loss of both MFWPs. They maintained post-trip Steam Generator EIIS:JB! levels at approximately 30 inches as designed. The Main Steam Relief Valves EIIS:SB! responded properly, without sticking open or requiring operator action to reclose them. Steam Generator pressure peaked at about 1060 psig and controlled at 1015 psig.

Following the trip, Operations shift personnel, the Integrated Scheduling (IS) Shift Manager, Operations Unit Support personnel, and others began evaluating the cause of the trip. The first indication on the Unit 2 Events Recorder EIIS:IQ! was a CBP Emergency Low Pressure Trip activated by PS-228. No low pressure alarm from PS-227 was indicated. Control Room chart recordings also did not indicate a decrease in pressure prior to the trip. Therefore an "investigating party" of various personnel examined PS-228. The pressure switch was found to have impact damage on the upper right hand corner. One of four mounting screws was missing at the same corner. Approximately one foot from the column, the concrete floor was chipped and a metal object was found on the floor near the base of the column. This object was a section of threaded rod, approximately 2-112 inches long and 2 inches in diameter, of the type used for large hanger supports. The impact damage on the instrument and on the floor had markings which matched the thread pattern on the rod section. Visual examination indicated that it had not broken off while in service but had been cut some time ago, presumably as scrap during fabrication of a hanger.

The "investigating party" personnel observed the existence of two 2-1/2 inch sleeves imbedded in the mezzanine floor almost directly over the instrument. The IS Shift Manager went upstairs to examine the sleeves from above. He found one sleeve to be partially obstructed by a strip of

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duct tape. The other sleeve, more directly over the PS-228, held a large hex nut, approximately 2 inches across the flats, threaded for a 1-1/2 inch rod diameter, and approximately one inch thick. The IS Shift Manager extracted

the nut from the sleeve. Subsequently, he partially inserted the threaded rod in the sleeve and determined that it would have passed through if it were inserted before the nut. His opinion is that it would be difficult to have the scrap rod fall or roll into the sleeve accidentally. It was also observed that PS-228 is offset slightly such that it is not obvious that an object falling through the sleeve hole would hit PS-228 unless it was first deflected. Therefore, several intervening hangers, beams, etc. were examined for signs that the rod had hit them and been deflected toward PS-228, but no such evidence was found.

Although the "investigating party" observed no other personnel on the mezzanine floor, a large tool box and equipment cart belonging to a maintenance crew was stored near the hole. Approximately ten feet away there were several pipes, fittings and small valves apparently pre-staged for future installation, but no maintenance or modification activities were actually in progress in that location on the day of the event.

Several other old pieces of scrap were on the floor near the column and a nearby railing. One member of the "party" reported sweeping compound on the floor in the area, but the crew supervisor for the station janitorial services vendor states that none of his people were in the area at the time of the trip.

Instrument and Electrical Technicians inspected and recalibrated the switch using Work Request 21667C and IP/0/B/275/10H, "Condensate System Condensate Booster Pump Instrument Calibration". The instrument was found out of calibration such that it was actuated at normal operating pressure. It did not reset at the expected reset pressure (21 psig increasing) so pressure was increased to 45 psig but it still would not reset. The I&E Technicians then replaced the missing mounting screw, tightened the existing screws and adjusted the setpoint. The instrument was calibrated and operated properly several times before being returned to service.

Two minor anomalies occurred during this event. The first anomaly was that the 2A Main Feedwater Pump stayed in AUTO following the trip. The problem was identified as a fault in the High Speed Stop Limit Switch and was repaired prior to restart. The second anomaly was that several minor components (e.g. Air Handling Unit 16, Vacuum Priming Pump C, Unit 2 Steam Packing Exhauster) stopped spontaneously but did not trip due to undervoltage relays or overloads. No major loads (i.e. 4160 switchgear or safety related components) tripped. No undervoltage alarms were received for the Start-up Source or the Main Feeder Buses. The Unit 2 Events Recorder indicated that a Rapid Transfer of the 4160 Volt feeder breakers

was initiated. However, it then cleared and indicated a second initiation. The affected Events Recorder points returned to normal state one second after the second initiation. The Events Recorder indicated that the 7KV Rapid

Transfer operated correctly.

CONCLUSIONS

It is concluded that PS-228, a Meletron type 2121-32A pressure switch, failed due to being struck by the falling scrap rod. This failure has been designated NPRDS reportable.

The root cause of this event is Management Deficiency for less than adequate housekeeping based on the fact that the scrap was available to fall or be dropped. Housekeeping had been recognized in the past as problem and has received increased management attention. Management will continue this higher level of attention.

A contributing cause of this event is Improper Action on the part of one or more unknown individuals for leaving the scrap materials in the area in violation of station policy on housekeeping. There is a possibility of an additional Improper Action, because it cannot be proven whether the scrap rod fell or was intentionally dropped. Because the openings do not line up exactly with PS-228, and because there is a five second time delay associated with PS-228, it is concluded that if some person did drop the rod section, that person did not expect to hit PS-228 and did not intend to cause a unit trip. It is possible that the rod and nut had been wedged in the sleeve for an extended period of time and the rod finally vibrated loose and fell.

Due to the inability to identify any specific individuals involved, no personnel related corrective actions have been taken.

The trips of individual 600 volt loads during the power supply transfer were apparently because the control power starter relays dropped out on these specific components due to low voltage during the transfer. A "slow" transfer would produce such a low voltage but existing data is too contradictory to conclude whether a Rapid transfer or a "slow" transfer occurred. Additional testing will be performed as part of the planned corrective actions for this event.

Although other unit trips have occurred with in the past twelve months, none were due to similar failure modes. Therefore, this event is classified as NON-RECURRING.

No releases of radioactive materials, radiation exposures, or personnel injuries occurred during this event.

CORRECTIVE ACTIONS

Immediate

1. The Emergency Feedwater System actuated automatically upon the loss of feedwater.
2. Operations shift personnel took appropriate action to control the transient and bring Unit 2 to stable hot shutdown.

Subsequent

1. The High Speed Stop Limit Switch on 2A Feedwater Pump was repaired prior to unit restart.
- 2 PS-228 was repaired, recalibrated and returned to service prior to restart.
3. The two sleeves were plugged with pipe plugs. The equivalent sleeves for Units 1 and 3 were inspected. Unit 1 sleeves contain cables and Unit 3 sleeves were already plugged.
4. The components which tripped off during the power transfer were restarted and returned to service.
5. Scrap materials and pre-staged equipment were removed from the area.

Planned

1. The Transmission Department will be testing relays in the transfer circuits during the upcoming Unit 2 refueling outage. They will verify proper operation of relay contacts which could have produced the observed Events Recorder indications.
2. Performance will perform a one time test to verify proper operation of the rapid transfer circuitry.
3. Maintenance will perform a survey for open floor sleeves and plug holes as appropriate.

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4. Operations will identify and review plant instruments which can initiate

a unit trip. They will then recommend instruments to be protected by covers.

5. Maintenance will review the list supplied by Operations and either install protective covers where appropriate or initiate Station Problem Reports to do so.

Recommended

None

SAFETY ANALYSIS

Loss of Feedwater is an anticipated transient and is analyzed in the Final Safety Analysis Report (FSAR). The unit equipment and Operations personnel on duty at the time of the trip performed as expected during this event. Specifically, the Emergency Feedwater System actuated the turbine driven and both motor driven pumps and controlled Steam Generator inventory properly. The Control Rod Drive System tripped all rods into the core to maintain shutdown margin. The Reactor Coolant System pressure and inventory was maintained within desired limits. No Engineered Safeguards setpoints were reached. No releases of radioactive materials occurred.

The most significant anomaly was the loss of several non-safety loads during the transfer of electrical power sources. The loss of these loads is acceptable, and, in fact, non-essential loads of this type will be load shed in several accident scenarios. The suspected cause in this event is a "slow" transfer. A "slow" transfer with a one second time delay rather than a rapid transfer of power from Normal to Start-up is acceptable, and is expected for several scenarios. The FSAR assumes 20 seconds for the emergency power source (Keowee Hydro) to become available after a LOCA. The Main Feeder Bus Monitor Panel has a nominal 25 second time delay for operation with no or low voltage before initiating emergency power actuation in non-LOCA situations. Therefore a "slow" transfer is of no safety significance.

As stated above, we do not believe this event to be an intentional act of sabotage due to the uncertainties associated with producing a unit trip by dropping the scrap rod on PS-228. However, sabotage by station employees is addressed by the Station Security and Safeguards Plans.

There were no personnel injuries, radiation releases or exposures, or other hazard to the employees or the public as a result of this event.

ATTACHMENT 1 TO 895150112 PAGE 1 OF 1

Duke Power

Company PO Box 33198
Charlotte, N. C 28242

CITIZENSHIP
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May 3, 1989

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
LER 270/89-04

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report (LER) 270/89-04 concerning a Unit 2 reactor trip on April 3, 1989.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

PJN

Attachment

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